



Differences in students' feelings and preferences in physical education classes: A comparison by degree of hearing loss

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Abstract

Introduction: Physical education is a very important discipline since it helps the development of students' cognitive abilities and motor skills. Also, physical education may be the best setting for individuals with hearing loss to learn about physical activity and a healthy lifestyle. **Purpose:** The objective of this study was to analyse differences in students' feelings in physical education classes and their leisure time preferences at the second grade of elementary schools for the deaf by degree of hearing loss. **Material and methods:** Participants were 86 students with hearing loss (severe to profound hearing loss, $n = 51$; 59.3%); an average age of 14.3 ± 1.4 years. Six elementary schools for the deaf participated in the research. The data were described using absolute and relative frequencies, including the mean and standard deviation. The non-parametric Mann-Whitney U -test, Kruskal-Wallis test, Fisher exact test, Chi-square test and Bonferroni post hoc tests were used for statistical analyses. For calculation of effect size coefficient $abs(r)$ was used. All tests were performed at a significance level of $\alpha 0.05$. Physical education is more popular among students with a more severe hearing loss ($Z = -2.409$; $p = 0.016$; $abs(r) = 0.260$). Relation to emotional response if a physical education class is cancelled, a small effect size coefficient ($abs(r) = 0.175$) was found, however statistical significance was not proven. Hearing loss affects the amount of leisure time spent listening to music – students with a less severe hearing loss do this activity considerably more often. By contrast, students who only use the Czech sign language do not listen to music. **Conclusion:** The degree of hearing loss has no negative effect on students' feelings in physical education classes and their preferences in leisure time.

Keywords: second grade of elementary school, deaf, special education, opinion, leisure time, sport

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INTRODUCTION

Physical education is an organized form of physical activity and is highly important educational field for the development of students' cognitive abilities and motor skills [1]. Physical education focuses on giving an understanding of one's own physical capabilities and the effects of physical activities on physical fitness as well as mental and social well-being [2]. Therefore, schools pose the key setting for the promotion of physical activity among students as they provide a convenient access to the majority of young people and possess the necessary facilities, personnel and nature to engage students in activity [3]. Generally, school-based physical education is an effective means of influencing the body and mind, and develop the range of motor and cognitive competencies, impaired due to the hearing loss. For this reason, physical education is essential for the students with hearing loss. Additionally, physical education may be the best setting for individuals with hearing loss to learn about physical activity [4-6].

Research has demonstrated that responsible and focused programming of physical education classes or sport training in leisure time can help develop fundamental motor and balance skills needed for students with hearing loss to maintain a physically active lifestyle [7-11]. When compared to hearing adolescents, deaf adolescents have been found to have lower levels of motor skills and physical fitness [12], which may negatively influence the functionality, the practice of physical education classes, sport and/or leisure activities [13-14]. Moreover, this could affect their social and emotional skills and they may struggle with social isolation [15]. Previous studies have also pointed out the importance of early intervention to address the balance deficit in deaf children [8, 16-17]. For example, interventions modified Pilates program was more effective in improving body balance control in students with hearing loss than standard physical education classes [11]. Another study [18] evaluated the effect of an interventional proprioceptive training and confirmed that the exercise program increased somatosensory ability and improved balance in children who are deaf. In the Rajendran's study [16], authors concluded that vestibular-specific neuromuscular training program may improve the motor skills, balance and health-related quality of life in children with hearing impairment. In the another study [17], authors tested the effect of 8 weeks of perceptual-motor training on bimanual coordination performance and static and dynamic balancing in students with hearing impairment aged 8-11 years in Kermanshah, and they concluded that perceptual-motor training may lead to improvements in coordination and balance of children with hearing impairment.

According to the Czech Statistical Office, it has been shown that Czech schoolchildren consider physical education and computers a popular school subject [19]. This finding was confirmed by the results of Kurková and Sigmund [20], where students who are deaf or hard of hearing preferred mainly computers and sport in their leisure activity (e.g. cycling, skating, aerobic, volleyball, football, and swimming). This finding was also confirmed by a study Kurková and Nemček [21], where teenagers who are deaf or hard of hearing do sport significantly more often in their leisure time in comparison with teenagers with visual impairment. When compared to students who are deaf or hard of hearing and their hearing classmates and students who are deaf or hard of hearing in schools for the deaf, mainstream students with hearing loss have been found to have negative emotional reactions. Those students felt fears misunderstandings in communication, delayed reactions when beginning a new activity and the fears surrounding the potential for breaking their hearing aids when participating in contact sports during physical education classes [22].

Each of these studies provide preliminary insight into physical education program and suggestions in educational settings of students with hearing loss; however, further work is necessary to clarify the essence of physical education and sport experiences among those individuals. The objective of this study was to analyse differences in students': (a) feelings and opinions on physical education classes with regard to the severity of hearing loss; (b) sport preferences in physical education classes and leisure time activity at the second grade of elementary schools for the deaf in relation to the severity hearing loss.

MATERIAL AND METHODS

Study sample

The sample was comprised of thirteen schools for the deaf in the Czech Republic, six elementary schools for the deaf agreed to participate in the research. Students with hearing loss meeting the following criteria were included: (a) having hearing loss of a minimum 25 decibels (in three frequencies of pure tones 500, 1000, and 2000 Hz); (b) studying at second grade in elementary school for the deaf. The exclusion criterion for all participants was additional combined disabilities (e.g. cognitive or visual impairment). Eighty-six students with hearing loss were included in the survey. The mean age and standard deviation was 14.3 ± 1.4 years, the age range was 11 to 17 years, and the median age was 14 years. In the Czech Republic, in all elementary schools for the deaf is possible to extend school attendance to ten years, upon approval from the ministry. In such a case, the first grade comprises years 1 to 6 and the second grade comprises years 7 to 10. In order to look at the possible relationships, we defined two categories of hearing loss severity: light to moderate hearing loss is defined ranging from 26 to 60 dB; severe to profound hearing loss including deafness is defined from 61 dB and more [23]. The demographic characteristics of participants are presented in Table 1.

Data collection

The data collection was carried out between April and May 2017 at the second grade of elementary schools for the deaf. To access the research for our group with hearing loss, a non-standardized structured questionnaire in modified form – adapted text version and video format in the Czech sign language – was used [24]. The students completed the questionnaire in the presence of the class tutor and the researcher. If necessary, a teacher, an interpreter from/to sign language was available to students with hearing loss in order to avoid any misunderstanding of the questions. The Ethics Committee of the Faculty of Education, Palacký University Olomouc, Czech Republic (No. 1/2016) approved the study. All subjects through their legal representatives signed an informed consent form before enrolment. In this study, we compare six scale questions concerning the differences in students' feelings based on the severity of hearing loss at the second grade of elementary schools for the deaf in physical education classes. The questions were related to their opinions and feelings about physical education classes and assessed: a) the popularity of physical education; b) the importance of physical education; c) the demandingness of physical education; d) effort in physical education classes; e) emotionality in physical education classes; f) emotional response if a physical education class is cancelled [24]. Furthermore, we compare student's preferences in physical education class and their leisure time activities. Participants were asked using a single item, "What activity do you most often do in your leisure time?"; and "Which of the following physical activities would you like to do in physical education classes?" Furthermore, demographic information of participants was obtained – age, onset of disability, degree of hearing loss, disability aid usage, type of disability aid, communication, hearing status and sport participation of parents.

Data analysis

The data were described using absolute and relative frequencies, including the mean, standard deviation and median. The non-parametric Mann-Whitney *U*-test, Kruskal-Wallis test, Chi-square test, Bonferroni post hoc tests and, for low frequencies, the Fisher's exact test were used for statistical analyses. Furthermore, effect size coefficient was used [25]. The *Z* value can be used to calculate an effect size, such as the *r* proposed by Cohen [25] where values $r = 0.50$, 0.30 , and 0.10 may be interpreted as large, medium and small effects. For scale questions 1 to 6, reliability in terms of internal consistency was verified using Cronbach's alpha. For questions 3 and 6, the scales of answers (numerical values) were reversed to provide measurement in the same sense as the other questions (due to the calculation of Cronbach's alpha, for any other processing they were left unchanged). According to Ponterotto and Ruckdeschel [26], our scale showed moderate internal consistency ($\alpha = 0.646$). All tests were performed at a level of 0.05. For statistical processing, the IBM SPSS Statistics for Windows (version 23.0; IBM Corp., Armonk, NY, USA) was used.

RESULTS

The baseline characteristics of the sample categorized by the degree of hearing loss is shown in Table 1. Using the chi-squared test, it was proven that students with a more severe hearing loss often use a cochlear implant ($\chi^2 = 7.278$; $p = 0.007$) and communicate in Czech sign language or use the Czech language together with the sign language ($\chi^2 = 27.742$; $p < 0.0001$). Furthermore, statistical significance was proven between the hearing impairment of children and their parents (father $\chi^2 = 16.444$; $p < 0.0001$ and mother $\chi^2 = 12.237$; $p = 0.0005$ respectively). Furthermore, using Fisher exact test, in relation to sports initiation, it was statistically proven ($p = 0.019$) that students with

Table 1. Sample demographic information

Variable	Light to moderate hearing loss (n = 35)		Severe to profound hearing loss (n = 51)		χ^2	p
	n	%	n	%		
Onset of disability						
Since birth	29	82.9	39	76.5	-0.439	0.660
Since age 1	0	0.0	4	7.8		
Since age 2	1	2.9	1	2.0		
Since age 3	2	5.7	7	13.7		
Since age 4	1	2.9	0	0.0		
Since age 7	1	2.9	0	0.0		
Since age 8	1	2.9	0	0.0		
Disability aid usage						
Yes	25	71.4	37	72.5	0.013	0.909
No	10	28.6	14	27.5		
Type of disability aid						
Hearing aid	3	8.6	3	5.9	7.278	0.007
Cochlear implant	1	2.9	4	7.8		
Communication						
Czech sign language	1	2.9	15	29.4	27.742	<0.0001
Czech language	17	48.6	2	3.9		
Combination	17	48.6	34	66.7		
Students' sport participation						
Competitive	12	34.3	17	33.3	0.345	0.842
Recreational	16	45.7	26	51.0		
No sport	7	20.0	8	15.7		
Students' sport initiation						
Parents	11	39.3	19	44.2	0.019 ^a	0.019^a
Teacher	8	28.6	21	48.8		
Others	9	32.1	3	7.0		
Friend	1	2.9	1	2.0		
Myself	2	5.7	0	0.0		
Coach	6	17.1	2	3.9		
Parents' hearing status						
Hearing father	34	97.1	29	58.0	16.444	<0.0001
Hearing impaired father	1	2.9	21	42.0		
Hearing mother	33	94.3	31	60.8	12.237	0.0005
Hearing impaired mother	2	5.7	20	39.2		
Parents' sport participation						
Sporting father	20	57.1	35	70.0	1.490	0.222
Nonsporting father	15	42.9	15	30.0		
Sporting mother	13	37.1	27	52.9	2.082	0.149
Nonsporting mother	22	62.9	24	47.1		

χ^2 – the value of the test statistic for the chi-squared test; ^aFisher's exact test; p – statistical significance (p-values < 0.05 are highlighted in bold).

Table 2. Intergroup comparison of mean values in students' feelings and opinions on physical education classes

Indicator	Light to moderate hearing loss (n = 35)	Severe to profound hearing loss (n = 51)	Total (N = 86)	Z	p	abs(r)
	M ± SD	M ± SD	M ± SD			
Popularity	2.29 ± 0.83	1.80 ± 0.92	2.00 ± 0.91	-2.409	0.016	0.260†
Importance	2.11 ± 0.96	1.96 ± 0.96	2.02 ± 0.96	-0.816	0.415	0.088
Demandingness	3.14 ± 1.06	3.29 ± 0.92	3.23 ± 0.98	-0.412	0.68	0.044
Effort	2.09 ± 0.82	1.96 ± 0.80	2.01 ± 0.80	-0.779	0.436	0.084
Emotionality 1	2.06 ± 0.80	1.96 ± 0.96	1.99 ± 0.82	-0.659	0.51	0.071
Emotionality 2	2.69 ± 0.93	3.06 ± 0.93	2.91 ± 0.84	-1.624	0.104	0.175†

SD – standard deviation; Z – Mann-Whitney U-test statistics; abs(r) – absolute value of Cohen's r; †small effect size; p – statistical significance (p-values < 0.05 are highlighted in bold).

Table 3. Students' preferences in physical education classes and their leisure time activity

Indicator	Light to moderate hearing loss (n = 35)		Severe to profound hearing loss (n = 51)		χ^2	p
	n	%	n	%		
Preferences in physical education classes						
Athletics	7	20.0	18	35.3	2.355	0.125
Aerobics	2	5.7	0	0.0		0.163 ^a
Badminton	1	2.9	8	15.7		0.076 ^a
Swimming	9	25.7	16	31.4	0.322	0.570
Gymnastics	1	2.9	1	2.0		1.000 ^a
Tennis	5	14.3	6	11.8		0.752 ^a
Frisbee	2	5.7	1	2.0		0.564 ^a
Combat sports	4	11.4	1	2.0		0.153 ^a
Floorball	17	48.6	24	47.1	0.019	0.890
Handball	5	14.3	3	5.9		0.262 ^a
Dancing	2	5.7	5	9.8		0.696 ^a
Football	13	37.1	26	51.0	1.604	0.205
Volleyball	2	5.7	10	19.6		0.111 ^a
Basketball	6	17.1	15	29.4	1.693	0.193
Dodgeball	10	28.6	8	15.7	2.082	0.149
Zumba	1	2.9	0	0.0		0.407 ^a
Health exercises	5	14.3	5	9.8		0.734 ^a
Leisure activity						
Television	10	28.6	10	19.6	0.934	0.337
Listening to music	18	51.4	7	13.7	14.309	0.0002
Listening to the radio	1	2.9	0	0.0		0.407 ^a
Doing sport	18	51.4	29	56.9	0.247	0.619
Visiting sport matches	5	14.3	14	27.5	2.090	0.148
Theatre, cinema, concert	2	5.7	6	11.8		0.464 ^a
Reading	3	8.6	5	9.8		1.000 ^a
Art	3	8.6	9	17.6		0.345 ^a
Friends	12	34.3	18	35.3	0.009	0.923
PC, mobile phone	15	42.9	24	47.1	0.148	0.701
Homework, gardening	8	22.9	14	27.5	0.230	0.631
Self-education	3	8.6	3	5.9		0.684 ^a
Idleness	1	2.9	4	7.8		0.644 ^a

χ^2 – the value of the test statistic for the chi-squared test; ^aFisher's exact test; p – statistical significance (p-values < 0.05 are highlighted in bold).

severe to profound hearing loss are more likely to be encouraged to do sports by their teachers and parents, while students with light to moderate hearing loss are more often encouraged by their coaches ($p = 0.058$) (Table 1).

Using the Mann-Whitney's U-test, it was proven that physical education is more popular among students with a more severe hearing loss ($Z = -2.409$; $p = 0.016$). The statistical significance in this domain was also confirmed by the small effect size coefficient ($\text{abs}(r) = 0.260$) – Table 2. Using the Kruskal-Wallis test, dependence between the popularity of physical education and communication preferences was proven ($\chi^2 = 8.151$, $p = 0.017$). Physical education is more popular among students who use sign language (75.0%) compared to students who use Czech (21.1%) or students who communicate in both ways (35.3%). Furthermore, using Bonferroni post hoc tests it was found that physical education is more popular among students who communicate in sign language compared to students who communicate in Czech ($p = 0.030$) or a combination of Czech and sign language ($p = 0.039$). Related to emotional response if a physical education class is cancelled (Emotionality 2), a small effect size coefficient ($\text{abs}(r) = 0.175$) was found, however statistical significance was not proven (Table 2).

In view of the sport preferences in physical education classes, the samples do not differ. Students with light to moderate and severe to profound hearing loss mostly prefer football (37.1% vs. 51.0%), floorball (48.6% vs. 47.1%) and athletics (20.0% vs. 35.3%) (Table 3). In terms of leisure time activities, using the Chi-square test, it was statistically proven that students with a less severe hearing loss spent their leisure time with listening to music significantly more often ($\chi^2 = 14.309$; $p = 0.0002$). Generally, students with light to moderate and severe to profound hearing loss mostly prefer doing sport (51.4% vs. 56.9%), computers and mobile phones (42.9% vs. 47.1%), and homework and gardening (22.9% vs. 27.5%) (Table 3).

DISCUSSION

The objective of this study was to analyse differences in students' feelings and opinions on physical education classes and their leisure time preferences at the second grade of elementary schools for the deaf according to the severity of the hearing loss. There is a limited research on self-reported opinions, feelings and preferences in physical education classes in students with respect to the degree of their hearing loss. Thus, we can discuss our results with other studies only generally.

In the Popularity indicator, students with severe to profound hearing loss perceive physical education as a more popular subject than those who have light to moderate hearing loss. Furthermore, physical education is more popular among students who communicate in sign language compared to students who communicate in the Czech language or a combination of Czech and sign language. This finding is in accordance with a survey by the Czech Statistical Office [19], where has been shown that Czech schoolchildren consider physical education and computers a popular school subject. Related to emotional response if a physical education class is cancelled (Emotionality 2), a small effect size coefficient was found, however, statistical significance was not proven. An interesting, yet statistically insignificant difference was found in other explored indicators, where students with a more severe hearing loss consider physical education to be less demanding, make more effort in physical education classes, and are more likely to be disappointed when a physical education class is cancelled. These intergroup differences may be due to the personnel, financial and spatial possibilities of a given school, where – in case of student with hearing loss – it is necessary to adopt a personalized approach and make use of modifications within physical activities. These aspects were also mentioned in other studies [4, 22, 27]. With respect to the degree of hearing loss, in cases of more severe hearing loss there is a noticeable influence of the institution (and, in turn, possibly the boarding school) and – in relation to sports initiation – the teacher's or the educator's influence on the student is predominant. Students with a more severe hearing loss are more physically active, which is consistent with their leisure activities in which these students most often do competitive or recreational sports. This outcome was also confirmed by a study by Stough et al. [28], where deaf students – despite the perceived limitation of grasping information – showed limited interest in watching television because

of the inconvenience of reading closed captioning. Contrarily, students with a less severe hearing loss spent their leisure time significantly more often listening to music.

In view of the sport preferences in physical education classes, the samples do not differ. Both groups of the students with hearing loss mostly prefer athletics, basketball, football, floorball and swimming. These findings are in accordance with previous studies focused on preferences in physical education classes [21, 29].

Current findings suggest that physical education in schools for the deaf takes place under specific conditions with respect to the communication needs of students with a hearing loss. Thus, successful performance in physical education classes might stimulate participation in physical activity within this minority population across a lifespan. This study has limitation that needs consideration in future research: the data was collected using only self-report methods. Future studies should consider other objective measures to evaluate students' feelings.

CONCLUSION

The severity of hearing loss has no negative effect on students' feelings or opinion on physical education classes and their preferences in leisure time. Students with a severe to profound hearing loss are more fond of physical education and consider it less demanding, they make more effort, and rate their feelings better. Hearing loss affects the amount of leisure time spent listening to music – students with a less severe hearing loss do this activity considerably more often. By contrast, students who only use the Czech sign language do not listen to music. With respect to the degree of hearing loss, in cases of more severe hearing loss there is a noticeable influence of the institution (and, in turn, possibly the boarding school) and – in relation to sports initiation – the teacher's or the educator's influence on the student is predominant. Students with a more severe hearing loss are more physically active, which is consistent with their leisure activities in which these students most often do competitive or recreational sports.

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